

ME 603 (FE for Biomechanics) - Lab MSK

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Part I

1. Which degrees of freedom enable ankle inversion/eversion?

subtalar_angle_r

2. To tilt the platform in the sagittal plane would you change platform_ry or platform_rz?

platform_rz

3. Why do you think the mtp_angle_r coordinate in the model is locked?

This is because the joint is under-actuated.

Part II

1. What is the maximum subtalar angle during the drop landing?

0.407 radians (23.319°)

2. Would an ankle inversion injury have occurred during this landing? According to previous research (Siegler et al., 1990; Lapointe et al., 1997), angles larger than 25 degrees may cause injury.

It is unlikely that an injury would have occurred during this landing as the maximum subtalar angle during the drop landing is lesser than 25° (0.436 radians)

Part III

1. You have now simulated three different drop-landing conditions: without an AFO, with a soft AFO, and with a stiffer AFO. What differences in peak ankle inversion do you observe between the simulations?

0.407 radians (23.319° - Without AFO)

0.688 radians (39.419° - SoftAFO)

0.326 radians (18.678° - StiffAFO)

So we see that the peak angle for stiff AFO is the least and maximum for soft AFO.

2. Could this AFO mitigate ankle inversion injuries?

The StiffAFO could indeed prevent ankle injuries having ankle inversion angle much lesser than the permissible limit for injury.

Appendix

Angle Inversion Diagrams

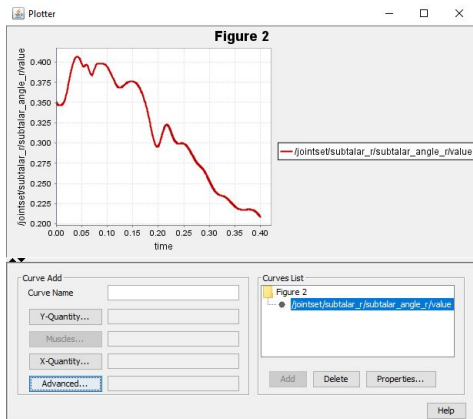


Figure 1: Without AFO

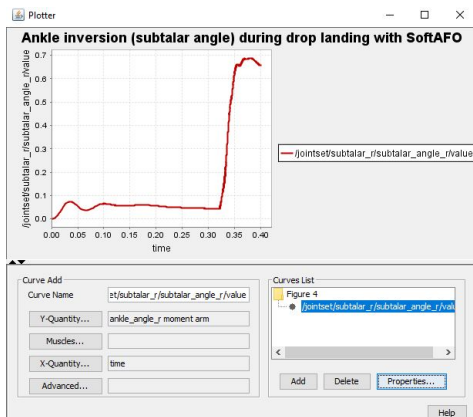


Figure 2: SoftAFO

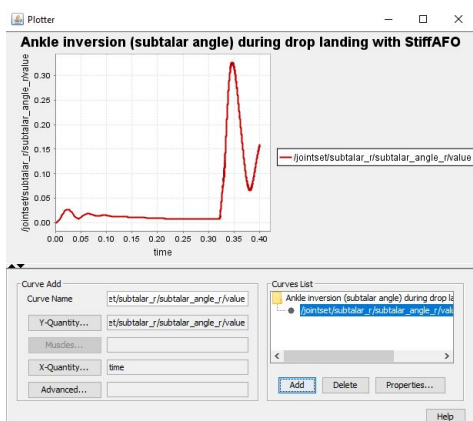


Figure 3: StiffAFO